the early 1500s and that the natives may not have had access to glass for making such beads. The many bubbles in these beads also suggest to him that European glass bottles did not furnish the raw material for making the beads.

In the absence of archaeological proof, we can try to resolve these differences by asking: 1) is the experimental technique likely to have been used for making beads?, 2) are the beads' characteristics those which would match this technique?, and 3) did the natives have access to glass for possibly making such beads?

In addition to Harris' experiments, Harris and Liu noted beads made in a similar method in India, citing van der Sleen (*Handbook*, 1975, pp. 27, 74; the perforation in his Fig. 40, p. 68, illustrating one such bead is at variance with the presumed method of manufacture). Sleen was relying on Dikshit, who mentioned beads made by heating and "piercing" in several papers. Dikshit has interpreted a passage of Kautilya's *Arthasastra* (ca. 4th c. A.D.) as a reference to this beadmaking technique (*East & West*, 1965, 15[1-2]:67) and said that he had witnessed the process himself being used at Ghodegere, Karnataka.

Dikshit further said that such beads had been found at Indian sites from early A.D., especially Ahichchhatra and Kondapur. Though I have examined some of the beads from these sites, none appear to have been made by heating and piercing a bit of glass. However, 2 beads from Kolhapur do seem to have been made this way; they are dark opaque blue with conical perforations and flat disc profiles.

Smith and I have discussed the green beads from S. America and examined such beads together in the collection of the University of Florida. I pointed out to him that the clarity of the glass is not a problem in this case, as the beads were not apparently made by the powder-glass method used in Africa and N. America. Glass beads made at Bida, Nigeria, by melting bottles and winding the glass as it melts are also very bubbly. He now agrees that the beads we have examined together do not appear to have been wound.

There remains the question of where the natives may have gotten the glass. Early explorers to the New World report that the natives wanted and were given not only glass beads but also pieces of glass or glass sherds. In October 1492, Columbus gave away pieces of glass on 3 occasions (S.E. Morison, 1967, *Journals and Other Documents*, pp. 67, 75, 79).

The Chimu Incas of Peru are known to have used European glass for a green glaze on some very early post-contact pottery (Bushnell, 1957, p. 137). The natives would not likely have had complete glass vessels, but pieces of glass given to them by Europeans with no further use for them or picked up around European settlements would not have been impossible for them to obtain.

In sum, the technique of heating a bit of glass in a crucible or mold or alternately dropping a bit of molten glass on a clay plate and piercing it with a pointed nail or similar metal object is a viable one for making small glass beads. The beads under discussion do appear to have the characteristics of beads made in this way; the conical perforations and roughened surface on one end are similar to Indian beads made in this manner, and the orientation of the bubbles toward and down through the perforations also suggest the technique. A limited number of glass sherds were available to S. American natives immediately after contact, and in at least one case (glazed pottery) are documented as having been recycled by them. Their metalsmiths, unacquainted with glassworking, could have mastered and even invented this piercing technique.

Further work is necessary to determine exactly which peoples might have made these beads. It is interesting to note that they were the only beads used in burials of the Manteno culture before 1550.

## 14. BEADMAKERS' STRIKE IN INDIA, by Peter Francis, Jr. (1984, 5:7-8)

February and early March just weren't the same in Papanaidupet. The village of 12,000 in southern Andhra Pradesh state provides all India with small drawn glass beads and marbles. But the tube-drawers working at 24 furnaces in the village had stopped drawing.

Tube-drawers come in pairs: one to manage the *lada* or *ladi*, a tapered tube which holds the glass as it is being drawn, and another to draw the tube out hand- over-hand for three hours running. The *pair* are paid 22 rupees a day (11 each), while the minimum daily wage for a man and the average daily per capita income is 5 rupees (a rupee is currently worth 9 cents U.S.). But they have also been forced to pay rent to the owners of the furnaces where they draw the tubes. So they drew the line at drawing glass tubes.

The issue highlights the "feudal" structure of the Papanaidupet glass bead industry. Two dozen families own furnaces and the land on which they are built. Some 300 men find work at the tube-drawing furnaces or the 30 small heating-and-tumbling units. Many people cut tubes and size and string beads–perhaps 5,000 altogether, counting women who do occasional stringing in neighboring villages. At the top of the ladder are four families who market the beads, some of whom make their own raw glass.

In the 1950s the government tried to start a glass bead and bangle center in Gudimallam, 3 kms (but a long walk) away. There is not even a trace of an industry now; perhaps the social system prevented any interfering government factory from being successfully launched.

Anyway, back at Papanaidupet, the workers who were paid $.99 a day were forced to pay 9 cents of that to the furnace owner (120 rupees per month divided by two teams). The strike was settled when the four trading houses agreed to pay the monthly rent to the furnace owners.

I visited Papanaidupet during and after the strike; afterwards work was going at double speed. Tube drawing which usually ceases at dawn was continuing until noon. The bead village is back in business.

**15. CENTER FOR BEAD RESEARCH ESTABLISHED, by Peter Francis, Jr. (1985, 6:6-7)**

The Center for Bead Research has been established in Lake Placid, New York. It is designed to serve as a repository of information about beads of all kinds and is open to scholars interested in any aspect of bead research.

The resources of the Center are a library of over 3,000 references, a photographic collection of over 2,500 prints and slides from public and private collections around the world, and a study collection. At the core of the study collection are examples obtained from excavations or directly from beadmaking centers with known provenances which may serve as references for scholarly investigation.

The activities of the Center include a publication series, *Occasional Papers of the Center for Bead Research*. The first monograph in the series, "A Survey of Beads in Korea," has now been published and several others are being planned. In February 1986, the Center will sponsor a bead tour of India which will visit museum collections, archaeological sites of past beadmaking centers, and the modern centers of Cambay, Purdalpur, Firozabad, and Papanaidupet.

Among the ongoing projects of the Center are the building of a computerized data bank of the literature to facilitate access to this information and the review and monitoring of periodical series in history, archaeology, anthropology, and other relevant fields to identify material on beads. Over 80 such periodical series have now been completed and are being monitored; others are designated for review. In the future the Center hopes to hold seminars and workshops on various problems related to bead research and to sponsor other tours of important beadmaking and bead-using areas.

**16. A BIT MORE ON THE CORNERLESS CUBE, by Peter Francis, Jr. (1986, 8:8-10)**

The note by Peter Schienerl in *The Bead Forum* (7:8-9) about the green stone cornerless cubes used as amulets by Egyptians, Bedouins, and Palestinians brought to mind a similar bead encountered in Iran. Like those described by Schienerl, they are of a green stone, found individually, and show heavy wear; they may have been worn as amulets in Iran as well. Among beads in my collection from Egypt are two "imitations" of these beads. One is a deep green glass wound bead pressed into the cornerless cube shape; the other is a bloodstone, which appears to be modern Cambay in origin.

The green stone appears to be jasper. Like agate, jasper is a crypto- ("hidden") or micro- ("tiny") crystalline form of quartz. The crystalline form of quartz includes rock crystal, smoky quartz, and amethyst. Chalcedony, including agate and carnelian, has a fibrous microcrystalline structure, while jasper has a granular microcrystalline structure. Bloodstone is a combined form of the two with a chalcedonic green base and red jasper flecks through it. Bloodstone is currently mined at a few spots in Gujarat, India (Tankara near Morvi and in the Little Rann of Kutch). Bloodstone cornerless cubes are exported from Cambay today, often on strands mixed with other types of agate beads. The earlier beads, however, were not bloodstone but green jasper.

The only dated green jasper cornerless cubes I have noted are in the National Museum in Tehran, Iran, displayed with material from Susa from the Sasassanian Period (A.D. 224-642). It is difficult to know how much trust can be put in these museum displays; Tehrani dealers bragged to me how they had sold the museum this or that necklace from such and such a site. I have written about this problem in Iranian museums before (Francis 1979:44).

In Iran cornerless cubes of green jasper, carnelian, quartz crystal, hematite, lapis lazuli, and pyrite are known. The pyrite is interesting, as one source for it is near Ratanpur (the source of most stones for the west India bead industry), and it can occur as natural cornerless cubes in its crystalline form.

As far as cornerless cubes in general are concerned, the earliest example that Beck (1928:17) noted was of blue glass from the Crimea in the 5th century B.C. While this date may be considered the beginning of general popularity of these beads, earlier examples are recorded. Two cornerless cubes, one of gold and the other of glazed steatite, were excavated from the upper levels at Mohenjo-Daro by Mackay (1938:516; LXXXII.5, CXXXIV.2). A lapis lazuli cornerless cube was found at Tall-i-Bakun, a